APPENDIX F: Air Quality Monitoring Summary for NETN

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Introduction

The NPS Air Resources Division (ARD) contracted with the University of Denver (DU) to produce GIS-based maps and an associated look-up table that provide baseline values for a set of air quality parameters for all Inventory and Monitoring parks in the U.S. These maps and table will serve as the Air Quality Inventory for the parks. ARD used preliminary DU products to help develop a strategy for expanding NPS ambient air quality monitoring with increased funding from the Natural Resources Challenge. At this time, ARD does not intend to fund additional monitoring at any NPS units in the Northeast Temperate Network. The air monitoring strategy will be revisited in FY 2004 if additional funding becomes available. Draft Air Quality Inventory products are available on the NPS Intranet (at http://www2.nrintra.nps.gov/ard/ under "Air Atlas") and are provided in an attachment to this report. Final products will be available on the NPS Internet site in a few months.

Data from the Air Quality Inventory, national air monitoring programs described below, and other air quality sources, were used in conjunction with park-specific resource information to evaluate the following needs relative to the Northeast Temperate Network: 1) the need for additional ambient air quality monitoring at any Network park, i.e., wet deposition, dry deposition, visibility, and/or ozone monitoring, and 2) the need for air quality effects-related monitoring at any Network park. The results of this evaluation, as well as a brief summary of results of past air quality monitoring at relevant sites, are discussed below.

Wet Deposition

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) is a nationwide network of precipitation monitoring sites. The network is a cooperative effort between many different groups, including the U.S. Environmental Protection Agency (EPA), U.S. Geological Survey, U.S. Department of Agriculture, and private entities. The NPS is a major participant in NADP/NTN, and the ARD recommends that any new wet deposition site installed in a park meet NADP/NTN siting criteria and follow NADP/NTN protocols. There are currently more than 200 NADP/NTN sites spanning the continental U.S., Alaska, Puerto Rico, and the Virgin Islands.

The purpose of the network is to collect data on the chemistry of precipitation to monitor geographical and temporal long-term trends. The precipitation at each station is collected weekly according to strict clean-handling procedures. It is then sent to the Central Analytical Laboratory in Illinois where it is analyzed for hydrogen (acidity as pH), sulfate, nitrate, ammonium, chloride, and base cations (such as calcium, magnesium, potassium and sodium). NADP/NTN's excellent quality assurance programs ensure that the data remain accurate and precise. The National Atmospheric Deposition Program has also expanded its sampling to include the Mercury Deposition Network (MDN), which currently has over 35 sites. The MDN was formed in 1995 to collect weekly samples of precipitation, which are analyzed for total

mercury. The objective of the MDN is to monitor the amount of mercury in precipitation on a regional basis.

Acadia National Park (NP) currently has a NADP/NTN monitor on-site; the rest of the parks in the Northeast Temperate Network have a monitor within 55 miles. Therefore, in terms of distance, the parks are well represented by current NADP/NTN monitoring. Intervening terrain or a difference in meteorology would affect how representative a site's data are for a park. In case the Network is interested in installing a NADP/NTN site, a site costs $5,000 to $8,000 for equipment purchase and installation, and operating costs (including site operation, chemical analysis, and reporting) are about $7,000 per year.

Acadia NP has an MDN site (site #ME98), plus there are three additional MDN sites in Maine: Freeport (site #ME96), Bridgton (site #ME02), and Greenville (site #ME09). The other closest MDN sites to the Northeast Temperate Network parks are in Milford, Pennsylvania, (site #PA72) and Newcomb, New York, (site #NY20). Adding mercury sampling to a NADP/NTN site increases annual costs by about $3,000.

Deposition varies with the amount of annual on-site precipitation, and is useful because it gives an indication of the total annual pollutant loading at the site. Concentration is independent of precipitation amount, therefore, it provides a better indication of whether ambient pollutant levels are increasing or decreasing over the years. In general, annual average wet deposition and concentration of sulfate, nitrate, and ammonium are higher in the eastern than in the western U.S. (see attached Draft Air Inventory maps; also see NADP/NTN maps at http://nadp.sws.uiuc.edu). At many NADP/NTN sites across the U.S., concentration and deposition of sulfate have declined in recent years as sulfur dioxide emissions have decreased. Trends have been variable for nitrate and ammonium, with concentration and deposition at various sites increasing, decreasing, or showing no overall change. Results from NADP/NTN sites in and near Northeast Temperate Network parks are summarized below.

Quabbin Reservoir, MA

Quabbin Reservoir, Massachusetts, has had an NADP/NTN site (site #MA08) since 1982. Data show a decrease in concentration and deposition of wet sulfate; a slight decrease in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

Lexington, MA

The Lexington, Massachusetts, NADP/NTN site (site #MA13 (East)) has been operating since 1982. While wet sulfate deposition has steadily decreased at the site, wet sulfate concentration decreased from 1985 through 1995, then increased since 1995. There has been no overall trend in concentration and deposition of wet nitrate. Data show a slight increase in concentration and deposition of wet ammonium.

Bridgton, ME

An NADP/NTN site has been operating at Bridgton, Maine, (site #ME02) since 1980. Site data show a decrease in concentration and deposition of wet sulfate; no overall trend in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

Carrabassett Valley, ME

The Carrabassett Valley, Maine, NADP/NTN site (site #ME04) was installed in 2002. Trend data are not yet available for the site.

Gilead, ME

The Gilead, Maine, NADP/NTN site (site #ME08) was installed in 1999. Trend data are not yet available for the site.

Greenville, ME

The NADP/NTN site has been operating at Greenville, Maine, (site #ME09 (Greenville Station)) since 1979. Site data show a decrease in concentration and deposition of wet sulfate; no overall trend in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

Acadia NP, ME

An NADP/NTN site has been operating at Acadia NP, Maine, (site #ME98) since 1991. Site data show a decrease in concentration and deposition of wet sulfate; no overall trend in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

Hubbard Brook, NH

The Hubbard Brook, New Hampshire, NADP/NTN site (site #NH02) has been operating since 1978. Data show a decrease in concentration and deposition of wet sulfate; a slight decrease in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

Pennington, NJ

Pennington, New Jersey, has had an NADP/NTN site (site #NJ99 (Washington Crossing)) since 1981. Site data show a decrease in concentration and deposition of wet sulfate; no overall trend in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

Claryville, NY

An NADP/NTN site has been operating at Claryville, New York, (site #NY68 (Biscuit Brook)) since 1983. Site data show a decrease in concentration and deposition of wet sulfate; no overall trend in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

West Point, NY

The West Point, New York, NADP/NTN site (site #NY99) was installed in 1983. Site data show a decrease in concentration and deposition of wet sulfate; a decrease in concentration and deposition of wet nitrate; and an increase in concentration and deposition of wet ammonium.

Bennington, VT

Bennington, Vermont, has had an NADP/NTN site (site #VT01) since 1981. Site data show a decrease in concentration and deposition of wet sulfate; no overall trend in concentration and deposition of wet nitrate; and no overall trend in concentration and deposition of wet ammonium.

Dry Deposition

The Clean Air Status and Trends Network (CASTNet) is considered the nation's primary source for atmospheric data to estimate dry acidic deposition. Established in 1987, CASTNet now comprises over 70 monitoring stations across the U.S. The majority of the monitoring stations are operated by EPA; however, approximately 20 stations are operated by the NPS in cooperation with EPA. Each CASTNet dry deposition station measures: weekly average atmospheric concentrations of sulfate, nitrate, ammonium, sulfur dioxide, and nitric acid; hourly concentrations of ambient ozone; and meteorological conditions required for calculating dry deposition rates. Dry deposition rates are calculated using atmospheric concentrations, meteorological data, and information on land use, vegetation, and surface conditions. CASTNet complements the database compiled by NADP/NTN. Because of the interdependence of wet and dry deposition, NADP/NTN wet deposition data are collected at or near all CASTNet sites. Together, these two long-term databases provide the necessary data to estimate trends and spatial patterns in total atmospheric deposition. The ARD recommends that all new dry deposition sites installed in parks use CASTNet siting criteria and follow CASTNet protocols.

Acadia NP has a CASTNet monitor on-site; all other Northeast Temperate Network parks have a monitor within 80 miles. Again, in terms of distance, the parks are well represented by current CASTNet monitoring. Given the expense of dry deposition monitoring, unless there is a particular need to better quantify dry deposition in a park, the ARD does not recommend the Network fund CASTNet monitoring. Installation and annual operating costs for a CASTNet site are about $50,000 and $15,000, respectively.

Because CASTNet uses different monitoring and reporting techniques than NADP/NTN, the dry deposition amounts are reported here as nitrogen and sulfur, rather than nitrate, ammonium, and sulfate. In addition, because CASTNet calculates dry deposition based on measured ambient concentrations and estimated deposition velocities, there is greater uncertainty in the reported

values. Due to the small number of CASTNet sites nationwide, use of dry deposition isopleth maps is not advised at this time. CASTNet data collected near Northeast Temperate Network parks is summarized below.

Abington, CT

The Abington, Connecticut, CASTNet site (site #ABT147) has been in operation since 1993. There have been decreasing trends in both dry nitrogen and dry sulfur deposition at the site. Total nitrogen deposition at Abington is composed of 24 percent dry deposition and 76 percent wet deposition, while total sulfur deposition is 21 percent dry and 79 percent wet.

Acadia NP, ME

A CASTNet site has been operating in Acadia NP, Maine, (site #ACA416) since 1998. Data have not been collected long enough to detect trends or quantify the composition of nitrogen and sulfur deposition.

Ashland, ME

The Ashland, Maine, CASTNet site (site #ASH135) has been operating since 1989. Site data indicate a decrease in both nitrogen and sulfur dry deposition. CASTNet estimates total nitrogen deposition at the site is composed of 17 percent dry deposition and 83 percent wet deposition, while total sulfur deposition is 22 percent dry and 78 percent wet.

Howland, ME

Howland, Maine, has had a CASTNet site (site #HOW132) since 1993. Site data show no trend in either nitrogen or sulfur dry deposition. Data indicate total nitrogen deposition is composed of 21 percent dry deposition and 79 percent wet deposition, while total sulfur deposition is 22 percent dry and 78 percent wet.

Hubbard Brook, NH

The Hubbard Brook, Hew Hampshire, CASTNet site (site #WST109 (Woodstock)) has been operating since 1989. Data show no trend in dry nitrogen or sulfur deposition. Site data show both total nitrogen and total sulfur deposition are composed of 8 percent dry deposition and 92 percent wet deposition.

Pennington, NJ

A CASTNet site has been operating at Pennington, New Jersey, (site #WSP144 (Washington Crossing)) since 1988. Site data indicate a decrease in dry sulfur deposition, but no trend in dry nitrogen deposition. CASTNet estimates total nitrogen deposition at the site is composed of 38 percent dry deposition and 62 percent wet deposition, while total sulfur deposition is 49 percent dry and 51 percent wet.

Claryville, NY

The Claryville, New York, CASTNet site (site #CAT175) has been operating since 1994. Data show a decrease in dry nitrogen deposition, but no trend in dry sulfur deposition. Total nitrogen deposition at Claryville is composed of 35 percent dry deposition and 65 percent wet deposition, while total sulfur deposition is 29 percent dry and 71 percent wet.

Lye Brook, VT

Lye Brook, Vermont, has had a CASTNet site (site #LYE145) since 1994. Data show no trend in dry nitrogen deposition, but an increase in dry sulfur deposition. Site data indicate total nitrogen deposition is composed of 34 percent dry deposition and 66 percent wet deposition, while total sulfur deposition is 26 percent dry and 74 percent wet.

Surface Water Chemistry

The Water Resources Division's (WRD) *Baseline Water Quality Data Inventory and Analysis* reports were reviewed for seven of the Northeast Temperate Network parks and other information was reviewed for an eighth park. Those data are summarized below. In general, acid-sensitive surface waters have a pH below 6.0 and an acid neutralizing capacity (ANC) below 100 microequivalents per liter (μeq/l).

Acadia NP

Acadia NP has been the site of an intensive water quality monitoring program since 1979. Lake and stream chemistry data indicate many surface waters in the park have low ANC. In fact, episodic acidification—when ANC drops below zero--has been documented during snowmelt and runoff. In spite of reductions in sulfate deposition in recent years, there has not been an improvement in pH or ANC of park lakes and streams. Also of concern is a regional decline in base cation concentrations in surface waters, which has resulted in a decrease in buffering capacity of some sensitive surface waters in the Northeast. The cause of the base cation decline is unclear, but may be associated with atmospheric deposition.

Marsh-Billings-Rockefeller NHP

A review of the 1997 *Baseline Water Quality Data Inventory and Analysis* report for Marsh-Billings-Rockefeller National Historical Park (NHP) showed a shortage of recent observations in the study area. The pH values on the Ottauquechee River in 1984 averaged 8.4. One water quality sample from Pogue Lake in 1984 had a pH of 8.0 and an ANC value of 1370 μeq/l, and one sample from an unnamed spring in 1977 had a pH of 7.3 and an ANC of 760 μeq/l. While these data indicate surface waters in the park are not susceptible to acidification from atmospheric deposition, given the limited nature and age of the data, it would be desirable to confirm this with data that are more recent.

Minute Man NHP

A review of the 1996 *Baseline Water Quality Data Inventory and Analysis* report for Minute Man NHP indicated no data had been collected in the park, and no pH or ANC data had been collected in the study area since 1971. Therefore, it is not possible to assess the sensitivity of park surface waters to acidification from atmospheric deposition.

Morristown NHP

A review of the 1994 *Baseline Water Quality Data Inventory and Analysis* report for Morristown NHP showed no data had been collected in the park, and no pH or ANC data had been collected in the study area since 1980. Therefore, it is not possible to assess the sensitivity of park surface waters to acidification from atmospheric deposition.

Roosevelt-Vanderbilt NHS

A review of the 1995 *Baseline Water Quality Data Inventory and Analysis* report for Roosevelt-Vanderbilt National Historic Site (NHS) indicated a fair amount of data had been collected in the park. Samples were collected at various locations along Fall Kill from 1979 to 1995. Average pH values ranged from 7.1 to 7.9, and average ANC values ranged from 640 to 930 μeq/l. Samples collected in Fall Kill Pond in 1979 had an average pH of 7.1 and an average ANC of 660 μeq/l. Samples collected at Meriches Kill in 1994 and 1995 had average pH values of 7.4 to 7.8 and average ANC values of 1200 to 1400 μeq/l. Samples collected at Crum Elbow Creek in 1994 and 1995 had an average pH of 7.4 and an average ANC value of 860 μeq/l. These data indicate surface waters in Roosevelt-Vanderbilt NHS are not sensitive to acidification from atmospheric deposition.

Saratoga NHP

A review of the 1997 *Baseline Water Quality Data Inventory and Analysis* report for Saratoga NHP showed pH data were collected at a number of locations in the park from 1987 to 1990. Sampled sites included Lower Kroma Kill, Upper Kroma Kill, Upper Kroma Kill Tributary, Lower Mill Creek, Mill Creek, Robbie's Ditch, American's Creek, Lower Devil's Hollow and Upper Devil's Hollow. Average pH values at the sites ranged from 7.9 to 8.3. These data indicate surface waters in Saratoga NHP are not sensitive to acidification from atmospheric deposition.

Saugus Iron Works NHS

A review of the *Baseline Water Quality Data Inventory and Analysis* report for Saugus Iron Works NHS showed some sampling has taken place in the park. A spring (CXS2) was sampled in 1988 and had a pH of 6.6. Blow-Me-Up Brook was sampled from 1982 to 1991 and 1997 to 1998. Average pH values ranged from 7.2 to 8.0, and the average ANC value for the 1982 to 1991 sampling period was 400 μeq/l. Average pH values in Blow-Me-Down Pond in 1997 and 1998 were 8.0, while average pH values in Blow-Me-Down Brook were 7.9. These data indicate surface waters in Saugus Iron Works NHS are not sensitive to acidification from atmospheric deposition.

Weir Farm NHS

A review of the 1997 *Baseline Water Quality Data Inventory and Analysis* report for Weir Farm NHS indicated no data had been collected in the park. Therefore, it is not possible to assess the sensitivity of park surface waters to acidification from atmospheric deposition.

Visibility

In 1985, in response to the mandates of the Clean Air Act, Federal and regional/state organizations established the Interagency Monitoring of Protected Visual Environments (IMPROVE) program to protect visibility in Class I air quality areas. Class I areas are national parks greater than 5,000 acres and wilderness areas greater than 6,000 acres, that were established prior to August 7, 1977. All other NPS areas are designated Class II. The objectives of the IMPROVE program are: to establish current visibility conditions in all Class I areas; to identify pollutants (particles and gases) and emission sources responsible for existing man-made visibility impairment; and to document long-term trends in visibility. In 1999, there were 30 official IMPROVE sites and 40 protocol sites. Because of recently enacted regulations that require improving visibility in Class I areas, the number of visibility monitors is increasing. Protocol sites are being upgraded to full IMPROVE sites and 80 new sites are being added to the IMPROVE network.

While the IMPROVE program has focused on Class I air quality areas, a great deal of visibility monitoring has been conducted in Class II areas. The ARD recommends that new visibility monitoring in NPS areas be conducted in coordination with the IMPROVE program (the IMPROVE program is managed out of the NPS ARD office in Fort Collins, Colorado). Installation and annual operating costs for a full IMPROVE site are about $15,000 and $30,000, respectively; however, partial monitoring, such as a camera-only site, is much less expensive.

There are ten IMPROVE sites in or near parks in the Northeast Temperate Network. A full IMPROVE site has been operating at Acadia NP (site #ACAD1) since 1988. Other IMPROVE sites have been operated by the U.S.D.A. Forest Service at the Lye Brook Wilderness Area, Vermont, (site #LYBR1) since 1991, and the Great Gulf Wilderness Area, New Hampshire, (site GRGU1) since 1995, and by the U.S. Fish and Wildlife Service at the Edwin B. Forsythe National Wildlife Refuge (NWR), New Jersey, (site #BRIG1) since 1991. States have been operating the following protocol sites: Mohawk Mountain, Connecticut, (site #MOMO1); Cape Cod National Seashore, Massachusetts, (site #CACO1); Martha's Vineyard, Massachusetts, (site #MAVI1); Quabbin Reservoir, Massachusetts (site #QURE1); and Bridgton, Maine (site #BRME1). The Penobscot Tribe operates the Old Town, Maine, protocol site (site #OLTO1). Therefore, all parks in the Northeast Temperate Network have an IMPROVE monitor within 85 miles. This is sufficient to provide a Network-wide assessment of visibility. If parks are interested in more site-specific monitoring, e.g., monitoring the plume from a nearby source, ARD can advise Network staff on how best to conduct this type of monitoring.

Data have been collected at Acadia NP long enough to assess long-term visibility trends. Unfortunately, the data show that views on the best, worst, and average visibility days decreased between 1988 and 1998. Not enough data have been collected and analyzed at the other sites to

perform trend analyses. 1996-1998 data show that, as with previous years, standard visual range is substantially lower in the eastern, than in the western, U.S. (see attached map). As for the sources of visibility impairment, 1996-1998 aerosol data from Acadia NP, Edwin B. Forsythe NWR, and Lye Brook Wilderness Area are consistent with data from other eastern U.S. IMPROVE sites. These data show that, on an annual basis, visibility impairment is primarily due to sulfates (sources include coal combustion and oil refineries), then organics (sources include automobiles), then nitrates (sources include coal and natural gas combustion and automobiles), then light absorbing carbon (sources include wood burning), then soil (from windblown dust).

Ozone

Acadia NP and Saratoga NHP have ozone monitors on-site, the other parks in the Northeast Temperate Network have one or more monitors within 35 miles. Existing monitoring is, therefore, adequate to represent ozone conditions in the parks. With the exception of Marsh-Billings-Rockefeller NHP, Saint-Gaudens NHS, Saratoga NHP, and parts of the Appalachian National Scenic Trail, all parks in the Northeast Temperate Network are in ozone nonattainment areas (see attached maps), meaning that the ozone levels in those areas exceed EPA's human health-based 8-hour National Ambient Air Quality Standard (NAAQS). In areas with high ozone concentrations, an ozone nonattainment designation can actually benefit the parks, because the designation requires the local or state air pollution control agency to take measures to reduce ozone levels. In case the Network is interested, installation and annual operating costs for an ozone monitoring site are about $90,000 and $14,000, respectively.

Vegetation

For vegetation, the focus is on ozone sensitivity because 1) ozone is a regional pollutant and is, therefore, more likely to affect park resources than other gaseous pollutants such as sulfur dioxide and nitrogen oxide which quickly convert to other compounds, and 2) the literature on ozone sensitivity is more recent and more reliable than that for other pollutants. Park vascular plant lists contained in the May 2001 NPSpecies database were compared to the lists of Ozone-Sensitive Plant Species contained in the NPS Synthesis information management system (see attached Synthesis species lists). The Synthesis lists were developed by an expert in the field of ozone effects on vegetation. Note that the Synthesis lists provide a general guide to ozone sensitivity. Differences in plant genetics, weather conditions, soil water availability, and ozone concentrations will affect whether or not a species exhibits injury in a particular park. In particular, studies have shown that plants will not take up ozone unless there is sufficient soil moisture. Ozone sensitive species of natural vegetation were identified for nine of the parks in the Northeast Temperate Network (see attached tables of sensitive species for Network parks). A vascular plant list was not available for either Appalachian National Scenic Trail or Boston Harbor Islands National Recreation Area (NRA) in the NPSpecies database.

It is generally agreed that plant foliar injury occurs after a cumulative exposure to ozone. One ozone statistic that is used to evaluate the risk of plant injury is SUM06. SUM06 is the sum of all hourly average ozone concentrations greater than or equal to 60 parts per million (ppm). In 1997, a group of ozone effects experts recommended 3-month, 8:00 a.m. to 8:00 p.m., SUM06

effects endpoints for natural vegetation, i.e., 8 to12 ppm-hrs for foliar injury to natural ecosystems and 10 to 15 ppm-hrs for growth effects on tree seedlings in natural forest stands. According to a SUM06 map generated by DU, some Northeast Temperate Network parks have ozone concentrations, during some years, that are high enough to harm native vegetation. 1995 to1999 seasonal average SUM06 values at Morristown NHP were 30-38 ppm-hrs; and at Boston Harbor Islands NRA, Minute Man NHP, Roosevelt-Vanderbilt NHS, Saratoga NHP, Saugus Iron Works NHS, and Weir Farm NHS, concentrations were 15-23 ppm-hrs. Concentrations along the Appalachian National Scenic Trail ranged from 0-6 to 23-30 ppm-hrs. It is not clear if ozone injury would be observed in Acadia NP, Marsh-Billings-Rockefeller NHP, or Saint-Gaudens NHS given that 1995 to 1999 seasonal average SUM06 values were 6-15 ppm-hrs. Ozone injury surveys in the early 1990s in Acadia NP did detect some injury, but the amount of injury per plant was slight, and it was on less than one percent of the plants examined in field surveys. Nevertheless, Network staff may want to conduct foliar injury surveys on sensitive plant species, at least in those parks with high SUM06 ozone values. Good survey species are black cherry (*Prunus serotina*) and milkweed (*Asclepias spp*) because 1) ozone injury symptoms for these species are well described and 2) standardized survey protocols and training manuals have been developed and can easily be adapted for Network parks. Based on the NPSpecies lists, black cherry and milkweed are presumed to occur in nine of the eleven Northeast Temperate Network parks.

Conclusions

Acadia NP currently has a NADP/NTN monitor on-site; the rest of the Northeast Temperate Network parks have a monitor within 55 miles. Current monitoring is likely adequate to represent wet deposition in Network parks.

Acadia NP has a CASTNet monitor on-site; the rest of the Northeast Temperate Network parks have a monitor within 80 miles. Given this distance and the adequacy of NADP/NTN monitoring, installation of additional dry deposition monitors is not recommended.

Water quality information was reviewed for eight of the parks in the Northeast Temperate Network. The information indicated surface waters at Roosevelt-Vanderbilt NHS, Saratoga NHP, and Saugus Iron Works NHS are not sensitive to acidification from atmospheric deposition. It would be necessary to collect pH and ANC data from Marsh-Billings-Rockefeller NHP, Minute Man NHP, Morristown NHP, and Weir Farm NHS to determine the sensitivity of the surface waters in those parks to atmospheric deposition. Lakes and streams at Acadia NP are currently being affected by atmospheric deposition. It is important that the long-term surface water chemistry monitoring program continue at the park.

Acadia NP has an IMPROVE monitor on-site; the rest of the Northeast Temperate Network parks have a monitor within 85 miles. This is sufficient to provide a Network-wide assessment of visibility.

Acadia NP and Saratoga NHP have ozone monitors on-site, the other parks in the Northeast Temperate Network have one or more monitors within 35 miles. Existing monitoring is,

therefore, adequate to represent ozone conditions in the parks. Seven of the parks, plus parts of the Appalachian National Scenic Trail, are in designated ozone nonattainment areas.

Ozone sensitive vascular plant species have been identified for nine of the parks in the Northeast Temperate Network. Ozone concentrations are high enough in many units to warrant foliar injury surveys. Black cherry and milkweed are good candidates for such surveys.

Relevant Websites

NADP - http://nadp.sws.uiuc.edu/

CASTNet - http://www.epa.gov/castnet/

IMPROVE - http://vista.cira.colostate.edu/improve/

Ozone - http://www.epa.gov/air/data/index.html

Pollution sources and air quality data - http://www.epa.gov/air/data/index.html

Pollution sources and monitors (maps and data) - http://www.epa.gov/ttnotag1/areas/

Summary of Ambient Air Quality Data Collected in and near National Park Service Units in the Northeast Temperate Network

PARK	NADP/NTN		CASTNet		IMPROVE		OZONE	
	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #
ACAD	On-site	ME98	On-site	ACA416	On-site	ACAD1	On-site Cadillac Mountain	230090102
							On-site McFarland Hill	230090103
APPA	West Point, NY 5 miles NW of Bear Mountain State Park, NY	NY99	Claryville, NY 55 miles W of Kent, CT	CAT175	Mohawk Mountain, CT within 5 miles	MOMO1	Montgomery, NY 15 miles NW of Bear Mountain State Park, NY	360715001
	Claryville, NY 55 miles W of Kent, CT	NY68	Abington, CT 65 miles E of Cornwall Bridge, CT	ABT147	Quabbin Reservoir, MA 45 miles E of Dalton, ME	QURE1	Milbrook, NY 10 miles W of APPA	360270007
	Quabbin Reservoir, MA 45 miles E of Dalton, MA	MA08	Lye Brook, VT about 10 miles SE of Glastenbury Mountain, VT	LYE145	Lye Brook, VT about 10 miles SE of Glastenbury Mountain, VT	LYBR1	Putnam County, NY Location unknown	360790005
	Bennington, VT about 10 miles SW of Glastenbury Mountain, VT	VT01	Hubbard Brook, NH, about 10 miles S of Mt. Moosilauke, NH	WST109	Glen House, NH within 5 miles of Mt. Washington, NH	GRGU1	Mohawk Mountain, CT within 5 miles	090050005
	Hubbard Brook, NH, about 10	NH02	Howland, ME	HOW132	Bridgton, ME 30 miles S of	BRME1	Mt. Greylock, MA	250034002

PARK	NADP/NTN		CASTNet		IMPROVE		OZONE	
	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #
	miles S of Mt. Moosilauke, NH		45 miles E of Monson, ME		Goose Eye Mountain, ME		within 5 miles	
	Gilead, ME, 10 miles S of Goose Eye Mountain, ME	ME08	Ashland, ME 60 miles NE of Mt. Katahdin, ME	ASH135	Old Town, ME 50 miles E of Monson, ME	OLTO1	Bennington, VT 5 miles W of APPA	500030004
	Bridgton, ME 30 miles S of Goose Eye Mountain, ME	ME02					Conway, NH 20 miles SE of Crawford Notch, NH	330031002
	Carrabassett Valley, ME, 5 miles S of Mt. Bigelow, ME	ME04					Coos County, NH Location unknown	330074002
	Greenville, ME 15 miles W of Barren Mountain, ME	ME09					Haverhill, NH 10 miles W of Mt. Moosilauke, NH	330090008
							North Lovell, ME 20 miles S of Goose Eye Mountain, ME	230173001

PARK	NADP/NTN		CASTNet		IMPROVE		OZONE	
	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #
							Dover-Foxcroft, ME 15 miles SE of Monson, ME	230210003
BOHA	Lexington, MA 15 miles NW	MA13	Abington, CT 60 miles SW	ABT146	Cape Cod NS, MA 60 miles SE	CACO1	Many in Essex, Norfolk, and Suffolk Counties	Many
					Quabbin Reservoir, MA, 60 miles W	QURE1		
					Martha's Vineyard, MA, 65 miles S	MAVI1		
MABI	Hubbard Brook, NH, about 55 miles NE	NH02	Hubbard Brook, NH, about 55 miles NE	WST109	Lye Brook, VT About 55 miles SW	LYBR1	Sullivan County, NH within 35 miles	330190003
	Bennington, VT 60 miles SW	VT01	Lye Brook, VT about 55 miles SW	LYE145				
MIMA	Lexington, MA within 5 miles E	MA13	Abington, CT 50 miles SW	ABT146	Quabbin Reservoir, MA, 50 miles W	QURE1	Many in Norfolk and Suffolk Counties	Many
					Cape Cod NS, MA 75 miles SE	CACO1		

PARK	NADP/NTN		CASTNet		IMPROVE		OZONE	
	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #
					Martha's Vineyard, MA, 75 miles S	MAVI1		
MORR	Washington Crossing, NJ 35 miles SW	NJ99	Washington Crossing, NJ 35 miles SW	WSP144	Edwin B. Forsythe NWR, NJ 85 miles S	BRIG1	Many in Essex County, NJ within 15 miles E	Many
ROVA	West Point, NY 30 miles S	NY99	Claryville, NY 35 miles W	CAT175	Mohawk Mountain, CT, 30 miles E	MOMO1	Poughkeepsie, NY within 5 miles S	360271003
	Claryville, NY 35 miles W	NY68					Millbrook, NY 15 miles E	360270007
SAGA	Hubbard Brook, NH, about 55 miles NE	NH02	Lye Brook, VT About 50 miles SW	LYE145	Lye Brook, VT About 50 miles SW	LYBR1	Sullivan County, NH, within 25 miles	330190003
	Bennington, VT 60 miles SW	VT01	Hubbard Brook, NH about 55 miles NE	WST109				
SAIR	Lexington, MA 10 miles W	MA13	Abington, CT 65 miles SW	ABT146	Quabbin Reservoir, MA, 65 miles W	QURE1	Many in Essex, Norfolk, and Suffolk Counties	Many
					Cape Cod NS, MA 65 miles SE	CACO1		

PARK	NADP/NTN		CASTNet		IMPROVE		OZONE	
	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #	LOCATION	SITE #
					Martha's Vineyard, MA, 75 miles S	MAVI1		
SARA	Bennington, VT 25 miles SE	VT01	Lye Brook, VT about 35 miles SE	LYE145	Lye Brook, VT about 35 miles SE	LYBR1	On-site	360910004
WEFA	West Point, NY 30 miles W	NY99	Abington, CT 80 miles NE	ABT146	Mohawk Mountain, CT, 40 miles N	MOMO1	Many in Fairfield County, CT within 15 miles	Many

NADP/NTN = National Atmospheric Deposition Program/National Trends Network

CASTNet = Clean Air Status and Trends Network

IMPROVE = Interagency Monitoring of Protected Visual Environments

NWR = U.S. Fish and Wildlife Service National Wildlife Refuge